● PRINTER RUSH ●
(PTO ASSISTANCE)

Application : 09/659375 **Examiner :** Fineman **GAU :** 2872

From: JF **Location:** IDC FMF FDC **Date:** 1-13-06

Tracking #: 1004112 Week Date: 11-28-05

DOC CODE	DOC DATE	MISCELLANEOUS
☐ 1449		☐ Continuing Data
☐ IDS		☐ Foreign Priority
☐ CLM		☐ Document Legibility
☐ IIFW		☐ Fees
☐ SRFW		☒ Other Amendment
☐ DRW		
☐ OATH		
☐ 312		
☐ SPEC		

[RUSH] **MESSAGE:** There is an amendment replacing the 2nd & 3rd paragraphs on page 8 lines 29-40, but there are no markings to indicate what is being deleted & what is being added.

Thank you

[XRUSH] **RESPONSE:** The change is to remove the paragraph break between "210." and "The width". Grant did not have paragraph break here (see attached). Amendment corrects typo introduced into the reissue application, so no "markings" were needed.

INITIALS: dof

NOTE: This form will be included as part of the official USPTO record, with the Response document coded as XRUSH.

REV 10/04

TABLE 1-continued

(First Example Embodiment)

Optical System Specifications

Surf. No.	r	d	Material	Group
0	—	70.000000		R
1	−497.01528	15.000000	CaF_2	A_{11}
2	−2089.03221	0.100000		
3	4955.40172	35.000000	SiO_2	A_{11}
4	−684.52303	0.100000		
5	373.53254	40.000000	SiO_2	A_{12}
6	−458.84391	32.494228		
7	−384.75862	15.000000	SiO_2	A_{13}
8	399.06352	11.499839		
9	∞	0		
10	∞	15.000000		
11	∞	0		
12	∞	30.000000		
13	∞	0		
14	∞	15.805933		
15	360.53651	60.00000	CaF_2	A_2
16	−357.18478	1.00000		
17	−410.75622	15.100000	SiO_2	A_2
18	272.78252	3.000000		
19	264.76319	55.000000	CaF_2	A_2
20	−403.51844	8.000000		
21	−313.01237	15.000000	SiO_2	A_2
22	−536.13663	141.754498		
23	753.93969	16.200000	SiO_2	A_2
24	350.20343	24.941513		
25	502.28185	22.500000	SiO_2	A_2
26	1917.58499	72.939269		
27	696.45818	25.920000	CaF_2	A_2
28	422.44154	45.000000		
29	−165.29930	15.000000	SiO_2	A_2
30	−247.15361	7.435035		
31	447.76970	4D.000000	SiO_2	A_2
32	−650.53438	176.819005		
33	−207.03257	15..000000	SiO_2	A_2
34	3807.25755	27.000000		
35	∞	0		
36	316.26451	27.000000	(M_1)	A_2
37	−3807.25755	15.000000	SiO_2	A_2^*
38	207.03257	176.819005		
39	650.53438	40.000000	SiO_2	A_2^*
40	−447.76970	7.435035		
41	247.15361	15.000000	SiO_2	A_2^*
42	165.29930	45.000000		
43	−422.44154	25.920000	CaF_2	A_2^*
44	−696.45818	72.939269		
45	−1917.58499	22.500000	SiO_2	A_2^*
46	−502.28185	24.941513		
47	−350.20343	16.20000	SiO_2	A_2^*
48	−753.93969	141.754498		
49	536.13663	15.000000	SiO_2	A_2^*
50	313.01237	8.000000		
51	403.51844	55.000000	CaF_2	A_2^*
52	−264.76319	3.000000		
53	−272.78252	15.000000	SiO_2	A_2^*
54	410.75622	1.000000		
55	357.18478	60.000000	CaF_2	A_2^*
56	−360.53651	15.805933		
57	∞	0		
58	∞	30.000000		
59	∞	0		
60	∞	130.000000		M_2
61	408.08942	20.000000	SiO_2	B_1
62	203.49020	3.000000		
63	207.52684	30.000000	CaF_2	B_1
64	19354.35793	0.100000		
65	429.85442	35.000000	SiO_2	B_1
66	−403.83438	14.478952		
67	−353.07980	15.000000	SiO_2	B_1
68	261.24968	31.363884		
69	−219.57807	23.000000	SiO_2	B_1
70	−348.23898	1.990938		
71	502.56605	40.000000	CaF_2	B_1
72	−747.25197	421.724019		
73	638.73572	29.160000	SiO_2	B_1
74	−809.39570	0.079197		
75	316.55680	32.805000	SiO_2	B_1
76	309.57052	15.000000		
77	—	54.627545		S
78	213.28576	51.714105	CaF_2	B_2
79	−7409.32571	13.778100		
80	−616.12401	39.000000	SiO_2	B_2
81	−1209.66082	0.373771		
82	472.08983	39.000000	SiO_2	B_2
83	1043.43948	0.267894		
84	103.01598	49.409891	SiO_2	B_2
85	77.85822	9.349712		
86	81.54405	32.465682	CaF_2	B_2
87	6656.48506	3.061800		
88	−400.35184	13.094819	SiO_2	B_2
89	−922.72813	1.399628		
90	1101.31959	16.951746	SiO_2	B_2
91	−554.93213	1.641793		
92	1392.34272	16.702978	SiO_2	B_2
93	3939.24661	15.000000		
94	∞			W

FIG. **4** provides graphs of transverse aberrations of the first example embodiment for several values of image height Y at three wavelengths. As is apparent from FIG. **4**, the transverse aberrations are well-corrected even at the full numerical aperture.

In the first example embodiment, the optical projection system does not project the entire reticle R onto the wafer W in a single exposure. Rather, as shown in FIG. **2**(*a*), an illuminated region **221** of the reticle R is projected onto a corresponding exposure region **231** on the wafer W (FIG. **2**(*c*)). In the first embodiment, the illuminated region **221** is rectangular, 120 mm long and 24 mm wide. The length of the illuminated region **221** is symmetrically placed with respect to a line **222** perpendicular to the optical axis **210**. The width of the illuminated region **221** is such that the illuminated region **221** extends from 52 mm to 76 mm from a line **223** perpendicular to the optical axis **210**.

The pattern from the entire reticle R is transferred to the wafer W by synchronously scanning both the reticle R and the wafer W during exposure of the wafer W. Arrows **241**, **242** indicate the scan directions for the reticle R and the wafer W, respectively. It will be apparent that other shapes and sizes of the illuminated region can be used.

In the first example embodiment, the turning mirror M_2 receives light reflected by the concave mirror M_1 and directs the light to the second imaging system B. The invention also provides an alternative arrangement in which the turning mirror M_2 receives light from the single-pass lens group and directs the light to the double-pass lens group and the concave mirror M_1. Light reflected by the concave mirror M_2 then propagates directly to the second imaging system without reflection by the turning mirror M_1. In the first example embodiment and in such a modification of the first example embodiment, the turning mirror M_1 thus separates light propagating from the double-pass optical group A_2 and light propagating to the double-pass optical group A_2.

A second example embodiment of the invention is shown in FIG. **5**. The optical projection system of FIG. **5** is similar to that of the embodiment of FIG. **2**. Light from an illuminated region **321** (FIG. **3**(*a*)) of a reticle R is directed to, beginning nearest the reticle R and along an optical axis **310**, a single-pass lens group A_1 comprising a first negative